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Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Power Economies—The Result of Lubrication in the Woolen and Worsted Mill

PUBLISHED BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS

TEXACO LUBRICATION CHART
FOR
WORSTED and WOOLEN MILLS

CLEANING EQUIPMENT

DUSTERS, WILLOWS, PICKERS, ETC.

Plain Bearings	
(Oil Lubricated)	TEXACO TEXOL D OR TEXACO ANSER OR ALEPH OIL
(Grease Lubricated)	TEXACO CUP GREASE NO. 3
Ball or Roller Bearings	
(In Oil-tight Housings)	TEXACO SPICA OR CETUS OIL
(Where Leakage May Occur)	TEXACO STARFAK GREASE NO. 2 OR TEXACO MARFAKS
Gears, Chains, etc. (According to Installation)	TEXACO TEXOLS TEXACO CUP OR VEGA GREASES OR TEXACO THUBANS

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COMB BOXES

(Grease Lubricated)	TEXACO STAZON BB OR B
(Oil Lubricated)	TEXACO TEXOLS OR TEXACO ALEPH OIL
Plain Bearings	TEXACO TEXOL D OR TEXACO ANSER OR ALEPH OIL
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(In Oil-tight Housings)	TEXACO SPICA OR CETUS OIL
(Where Leakage May Occur)	TEXACO STARFAK GREASE NO. 2 OR TEXACO MARFAKS
Gears and Chains (According to Installation)	TEXACO TEXOLS TEXACO CUP OR VEGA GREASES OR TEXACO THUBANS
Aprons	TEXACO 723 OIL

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Gears, etc. (According to Installation)	TEXACO TEXOLS TEXACO CUP OR VEGA GREASES OR TEXACO THUBANS
Backwasher Drums	TEXACO HYTEX GREASES OR TEXACO MARFAKS

(Continued on Inside Back Cover)

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Power Economies—The Result of Lubrication in the Woolen and Worsted Mill

WHEN the textile industry entered the doldrums of depression some few years ago, akin to many others, it was in the midst of a program of improved mechanization. In the beginning this work was conceived by the demands for increased production; later it was actuated by competition; finally it was seen to be possessed of economic advantages which even the most drastic curtailments in expense could not outweigh. Hence the progress which has been made in the adaptation of the ball and roller bearing; improved methods of lubrication; the installation of variable speed transmissions and other mechanisms to conserve power.

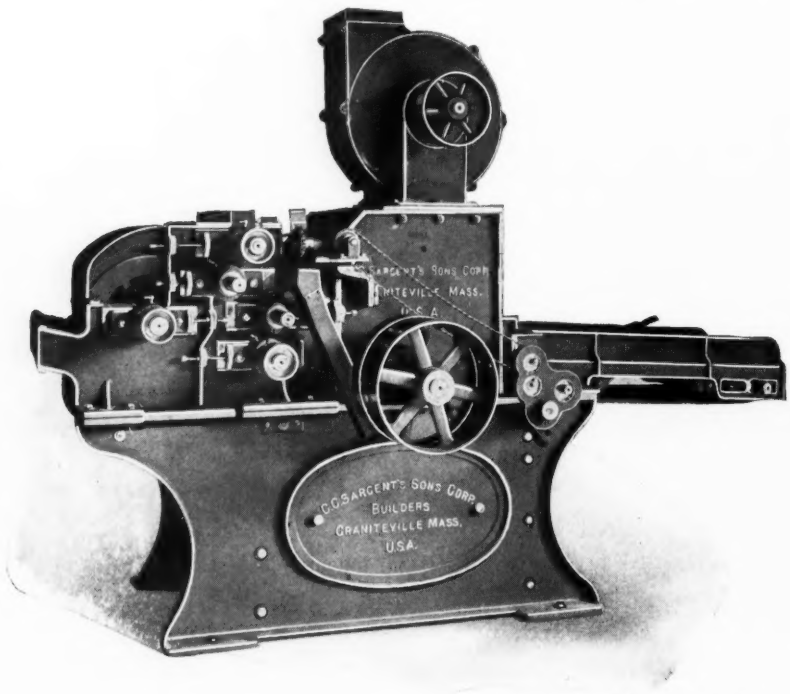
In the manufacture of woolens and worsteds the necessity for careful attention to lubrication became more apparent than ever, due to the perishable nature of the yarns and fabrics at various stages of processing. Many of these processes for preparing raw wool for weaving into fabrics are intricate and diversified. In all, whether they involve carding, combing, twisting or spinning, etc., there is always a possibility of the product under treatment being stained by the use of unsuitable or contaminated lubricants, or by careless application.

Petroleum lubricants will tend to produce oil stains on practically any type of yarn or fabric with which they come in contact. To a certain extent dependent upon the purity of the oil and the degree of its refinement, stains of this nature can be emulsified by suitable soaps or fatty matter to enable more or less complete removal under subsequent washing. The fact, however, that oil stains will very frequently have a tendency to reappear, especially in white or light colored fabrics renders it decidedly imperative that their occurrence be minimized. This care, of course, will also reduce the expense and time that would otherwise have to be given to washing and removal of oil spots. For this reason an understanding of the machinery and mechanisms employed in the woolen industry is highly advisable.

There are two distinct classifications in this phase of the textile industry, dependent upon the nature of the wool which is to be worked They comprise the manufacture of (1) worsted, and (2) woolen goods. The length and arrangement of the wool fibres is the determining factor, the worsted industry working with a long fibred product such as combing wool up to several inches in length. In a worsted yarn the fibres are combed to render them approximately parallel. The woolen mill, in turn, will utilize wools of shorter length. Inasmuch as these shorter fibres are not adapted to satis-

factory combing, this process is not involved in the manufacture of woolens, as a result, the fibres in woolen yarns lay in every direction.

Scouring is the first treatment to which raw wool is subjected after sorting and clipping. It is essentially a cleansing process whereby the product is either washed with soap and alkaline solutions, or treated with a solvent such as naphtha. The purpose in either case is to remove vegetable matter, dust, dirt and grease.



Courtesy of C. G. Sargent's Sons Corp.

Fig. 1—Showing a multiplex burr picker equipped with ball bearings.

PROCESSES IN THE WORSTED MILL

In the worsted mill carding follows the process of scouring and drying. Carding opens out the fibres and renders them parallel as far as possible. In operation it involves passing the wool between feed rollers and cylinders surfaced with numerous small wire ends. These wires are held in place by leather or cloth backings in which they are set. There are a number of such cylinders varying in direction of rotation, speed and diameter.

As a result, after the wool has been once fed in by the first or "licker-in" roller, it is subjected to a continued carding and stripping action always in the same direction, which serves to disentangle and lay the fibres parallel. As the wool passes over the last roller, or doffing cylinder, it is removed by a doffing comb which vibrates across the surface of this roller. The wool at this stage resembles a fibrous veil. It is then condensed into the form of a continuous rope or "sliver" by being led through a funnel-shaped orifice, to be ultimately wound into balls ready for gilling and back-washing.

The first treatment which takes place in the backwasher involves a mild washing process. It requires the passage of a number of slivers through suitable washing baths to remove any remaining foreign matter. They are then drawn through a dryer and automatically combined into one. Following this a number of the resultant slivers are subjected to drawing or reduction by passage through a series of gill boxes. In these latter the product is passed through rollers and between the vertical steel pins of the fallers. In this way the slivers are flattened and drawn down in diameter; ultimately the product passes through a condenser funnel to be once again brought to the form of a sliver. A number of such gilling treatments may be necessary according to the nature of the stock.

Combing

The slivers are ready for combing after sufficient drawing, etc., in the backwasher, drying and preliminary gilling operation. The combing process constitutes the removal of shorter fibres which are not capable of suitable spinning, and final straightening or paralleling of the remaining long fibres.

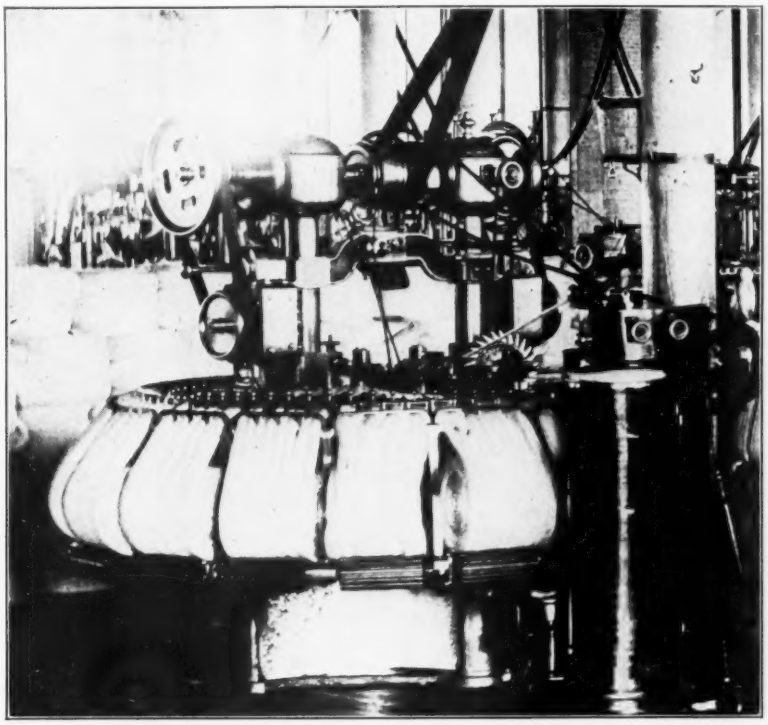
The resultant product as it passes from the comber is known as a "top." Frequently it is passed through a finisher gill before winding into a ball suitable for drawing.

The short or waste fibres which are removed are known as "noils." They are not actually wasted, however, being suited to either woolen or knitting mill operations. These "noils" will contain oil which has been added to the wool in gilling to facilitate combing. In consequence the resultant "tops" can be aged or stored with usually perfect safety, especially where compounded mineral oils have been used for conditioning purposes. If emulsifiable compounds containing fixed oils have been em-

ployed, there will be a possibility of rancidity, gumming, oxidation and spontaneous combustion occurring. As a result they must be used as sparingly and evenly as possible. This also applies to mineral oils, but from another angle. These latter products if used to excess will tend to cause staining and discoloration of the wool during storage, and also the possibility of a certain amount of gumming.

Drawing and Spinning

Up to this stage the purpose has been to prepare, parallel and straighten the fibres for spinning. Dependent on the nature of the stock, the subsequent drawing processes will involve a number of steps. By a series of such drawing operations, several slivers are condensed down to one, each successive operation reducing the product in fineness. The final drawing is carried out on a roving machine which gives the requisite amount of preliminary twist for ultimate spinning. Such twisting is necessary where spinning is carried out on a ring, cap or flyer type spinning frame, according to the Bradford system. This is most generally used in the manufacture of worsteds. In the French system, however, no preliminary twisting of slivers is necessary for spinning on the mule frame.



Photograph from Textile World.

Fig. 2—A typical worsted comb showing method of drive.

Cap spinning is probably the most generally used for worsteds. It is advantageous in that vibration is low due to the motion of the bobbins in fixed caps, therefore spindles may be rotated at high speeds. This, of course, involves more attention to selection and application of spindle oils.

The purpose of spinning of worsted yarns is to give them the necessary twist and strength for weaving. There is no further drafting and the relative position of the fibres is fixed.

MANUFACTURE OF WOOLEN YARNS

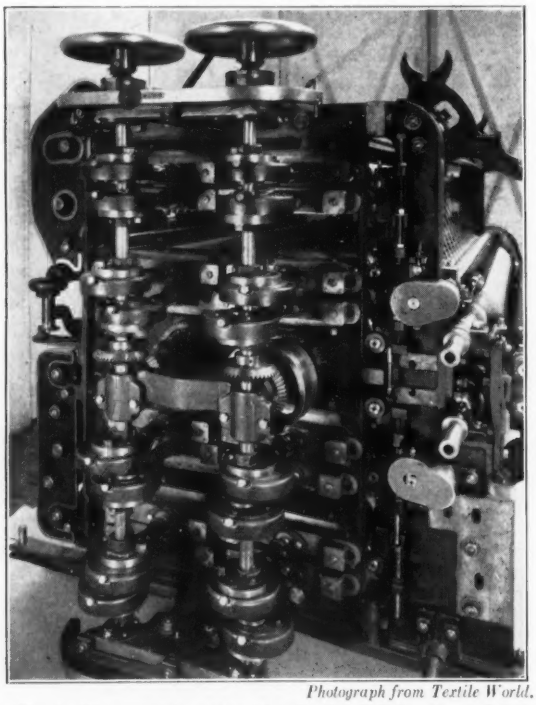
The shorter staples which are used for woolen yarns require no straightening or paralleling of fibres. In fact, the more they are interlaced the better. They do, however, require very careful cleaning to remove vegetable matter. In some cases it will be desirable to follow up scouring with a carbonizing treatment which embodies dipping the wool in sulphuric acid or aluminum chloride, and drying at a constant temperature somewhat above 180 degrees Fahr. After drying, the product is baked at higher temperatures in a series of oven compartments. In this way vegetable matter or cotton from rag stock is carbonized and practically burned out, the wool coming through clean and unharmed.

Carding of Wool

Carding of woolen products is much similar to carding of worsteds. Usually, however, it is a more intensive operation for the primary purpose is to open up the fibres and in this case interlace them as much as possible to enable better felting ability. The actual operation of a woolen card is, however, practically the same as a worsted card, although the removal of the product differs in that the sheet of wool as lifted by the doffer is either split into ribbons by means of ring doffers, or divided into suitable widths by a tape condenser. These divisions are then condensed through rollers and rubbing aprons which produce the small, soft slivers required for spinning on the mule frame. Carding is practically the only treatment the wool receives before spinning. Combing and drawing are unnecessary since the quality of the product is dependent upon the extent to which its fibres are interlocked.

Mule Spinning

As a result, the roping will generally pass directly from the card to the spinning mule in woolen mill operations. This unit is a long and



Photograph from Textile World.

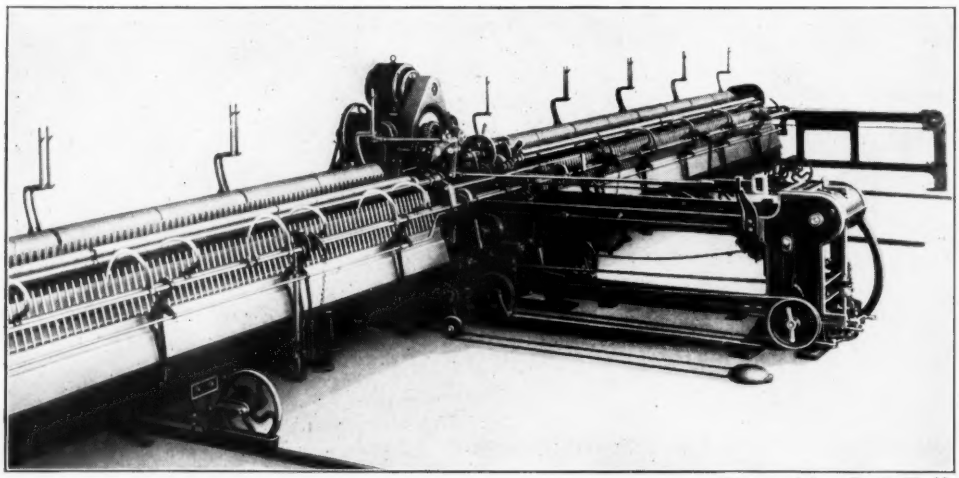
Fig. 3—The eccentric motion of a Proctor & Schwartz condenser. This machine is extensively equipped with ball bearings. The entire construction of the mechanism has been designed to permit of high speeds without heating or throwing of the lubricant.

wide machine on which drawing and twisting are practicable. The roping is wound on jack spools at the back of the machine, usually in three or four tiers, or on long beams or spools. From here it is passed between drawing rollers. Coming out of the rollers it is fed to the spindles on the mule which backs away from the frame and recedes somewhat faster than the roping is unwound. This receding is the essential motion of the machine, for thus the material receives its final drawing. The spindles, meanwhile are revolving rapidly, spinning the yarn. The twist goes first to the thin places where the least resistance is offered. Then, as the mule carrying the whirling spindles continues to back away, the thicker parts of the thread, being comparatively untwisted, are pulled down to the average diameter and subsequently twisted.

At the termination of the run or stretch of the mule, the spindles increase their speed until the twisting is completed, then the mule starts on its return trip. This reverses the spindles, the slack being taken up by one guide wire while the other guides the thread to the winding point, and winds it up in the opposite direction on the cone-shaped cops or bobbins on the spindles. The rollers do not feed out more roving as the mule returns, hence, there is no slack when the round trip is completed. Following the process of spinning the yarn is wound onto suitable spools, etc., preparatory to weaving.

WEAVING OF WORSTEDS AND WOOLENS

The process of weaving is essentially the same for both worsteds and woolens. Both require a more or less extensive finishing treatment according to the nature of the cloth, the extent to which the weave is to be shown up, or the variety of finish desired.

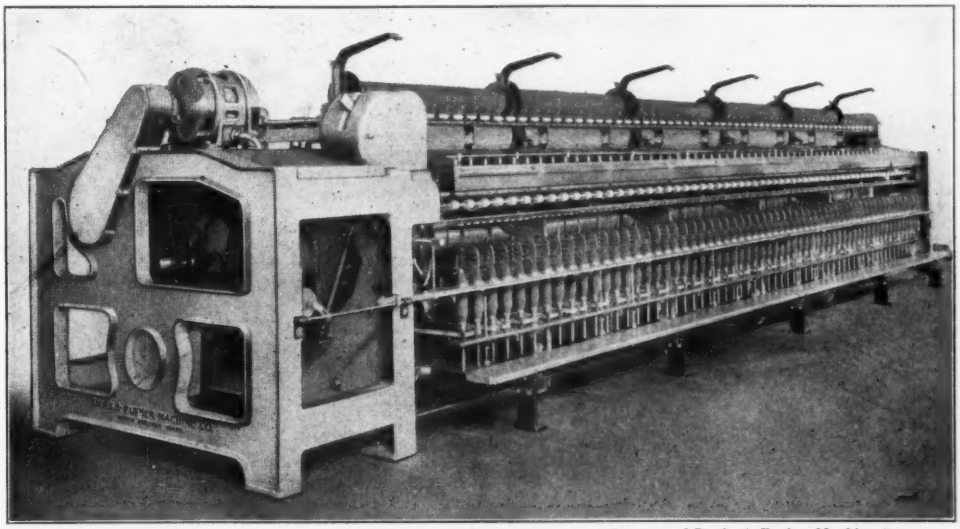


Photograph from Textile World.

Fig. 4—Showing a typical mule spinning mechanism.

Prior to the actual process of weaving, however, a number of preparations must be made, involving what is known as loom mounting.

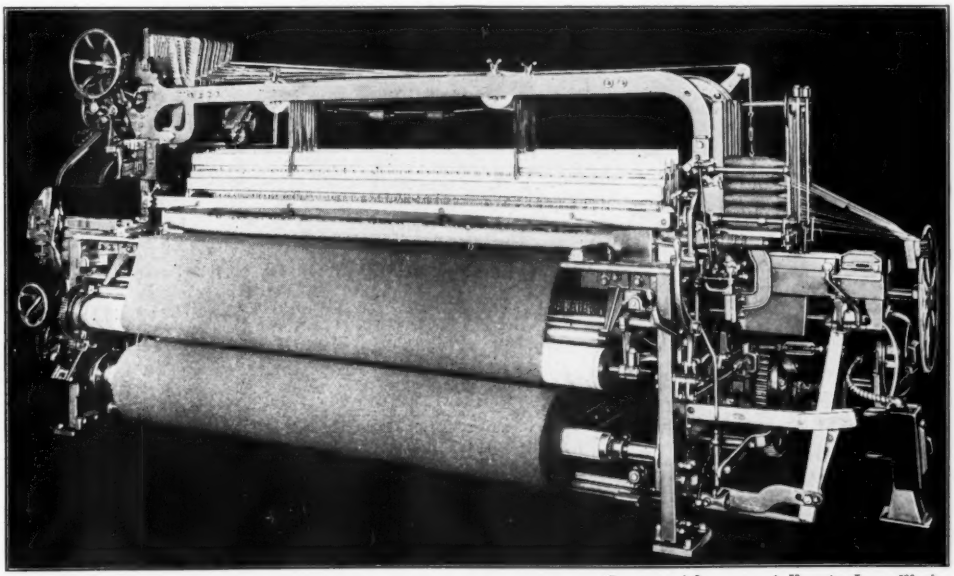
In general five distinct handlings will be required. The first is known as warping, and constitutes the arrangement of the warp or lengthwise threads in the proper order. For this purpose a warping machine can be used. It is also sometimes necessary to size the warp to smooth down the fibres and impart the requisite strength for weaving. This is accomplished by passing the warp through a bath of sizing solution, after which it is run through the compression rollers of a slasher, being dried by hot air or steam. The warp is then wound onto the loom beam, which serves to deliver the threads in proper order to the loom. This beam is cylindrical in form, being mounted at the back of the loom. From here on the preparatory processes involve the proper location of the respective threads, according to the weave or pattern desired.



Courtesy of Davis & Furber Machine Company.

Fig. 5—Another type of wool spinning machine showing in particular the manner of housing the drive mechanism.

In the so-called healding process the warp is arranged so that the shuttle passes over certain threads and under others. The final step is known as sleying, and constitutes the leading of the warp between the reeds or wires of the



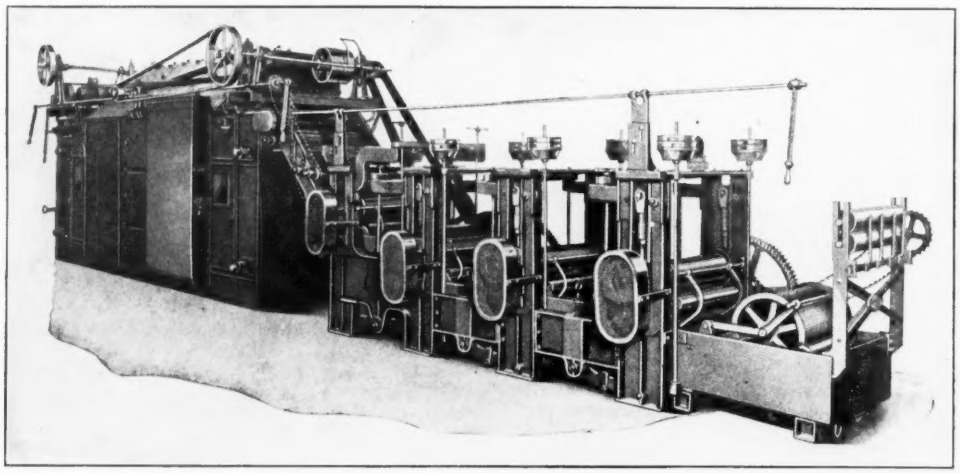
Courtesy of Crompton & Knowles Loom Works.

Fig. 6—Details of a typical loom. The intricate nature of the parts requiring lubrication can be readily discerned.

sley in order to insure that each thread will keep its proper distance from the other during subsequent weaving.

The weft or crosswise threads, on the other hand, will not require any additional treatment after spinning. Yarn is made into cloth on the loom by interlacing the threads of the warp with those of the weft by means of a shuttle. The threads from the loom beam are threaded through heddles in what are known as harnesses. In plain weaving there are two harnesses, and each takes every alternate thread from the beam. In fancy weaving there may be several harnesses. In operation the harnesses are raised and lowered, according to design, so that the threads give the appearance of a V on its side. Crosswise in this V a weft thread is carried by the shuttle and pushed up close into the angle by a "reed". The harnesses then change position so that some or all threads that were in the upper side of the V are in the lower and vice versa, and the shuttle passes back and the reed again pushes up the thread into the angle.

During the process the loom beam feeds in the threads in the proper amount and the woven cloth is wound up on a roller. Auxiliary to this operation are attachments for automatically changing bobbins, and for stopping the machine if the thread breaks or shuttle fails to cross the warp completely.



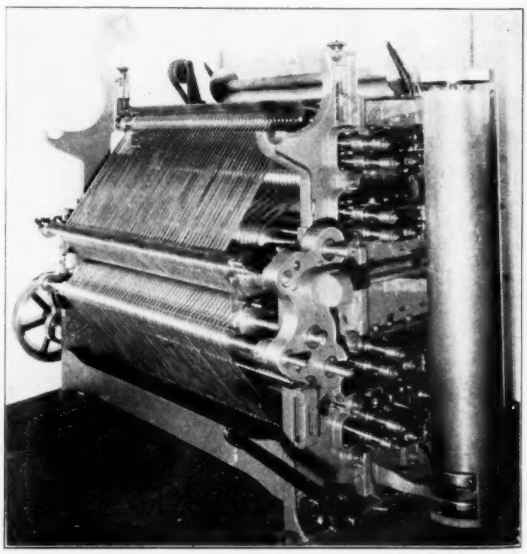
Courtesy of C. G. Sargent's Sons Corp.

Fig. 7—A four-bowl backwasher and loop type of dryer.

FINISHING OPERATIONS

Some worsted cloth as it leaves the loom is practically a finished product. Normally, however, finishing by fulling or shrinkage is necessary to give it additional body. Some mills also piece-dye after weaving. Woolens, likewise, require an intensive finishing treatment which in general will materially alter the appearance of the loose, raw weave. The purpose is to produce certain definite finishes according to market requirements.

Fulling or shrinkage as the first of the finishing processes, provides for running the cloth successively through soap solutions and rollers. The extent to which shrinkage will occur depends, of course, upon the intensity of the fulling process. Rinsing follows for removal of dirt and final cleaning.



Courtesy of Whitin Machine Works.

Fig. 8—A woolen tape condenser. This unit delivers wool from the finisher card ready for spinning. The operating mechanism is plainly shown.

The next step involves raising, opening out or brushing up of the fibres into a nap, in order to enable subsequent shearing where necessary

for the purpose of making the weave stand out. This is accomplished with the cloth either wet or dry by running it over a drum fitted with a suitable brushing device. The final step is a cropping or shearing operation to remove a certain amount of the nap according to the nature of the finish desired.

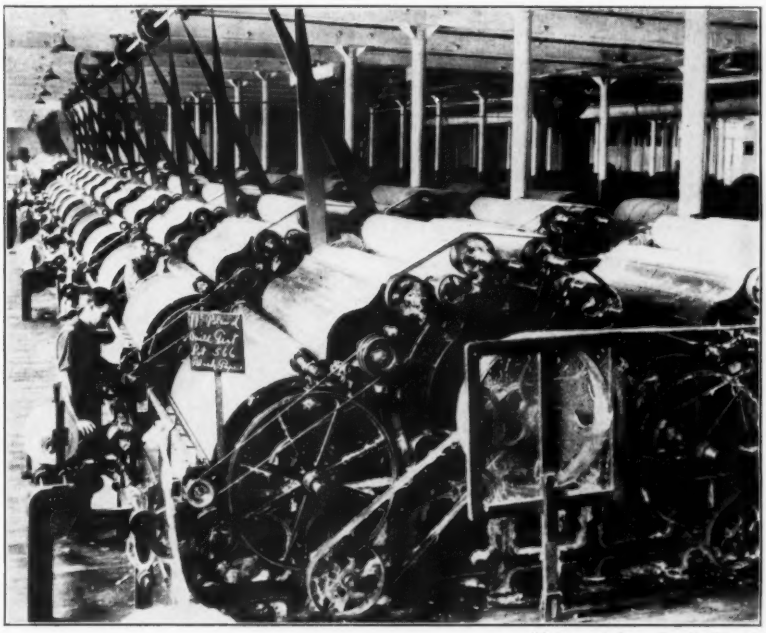
LUBRICATION PROCEDURE

Scouring Machinery

Wool scouring requires an assortment of washing, soaking and rinsing vats, and dryers of the apron or rotary type, to which the wool is passed after rinsing. The working parts involve shaft and journal bearings, gears and driving chains, or belt connections to overhead line shafting.

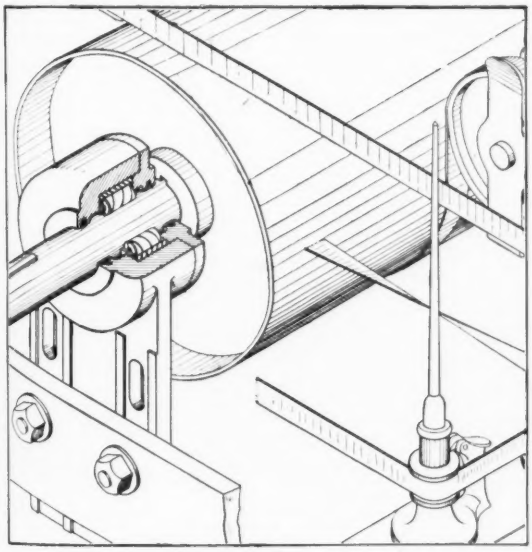
In the lubrication of scouring machinery protection of the raw product is not essential, for the wool in this state is not as yet subject to damage from splashed or dripped lubricants, therefore, the care that must be observed later on in their application is not as necessary. This should not be implied as meaning that sloppy usage may be tolerated. The progressive Mill Manager desires oil and grease economy quite as much in his scouring room as elsewhere in the mill.

For plain bearings of the various mechanisms involved in scouring, either oil or grease can be used according to the means available for application. For oil cups, ring oilers and other similar devices a straight mineral machine oil of from 250 to 400 seconds Saybolt viscosity at 100 degrees Fahr., will be satisfactory. Where grease must be used, a medium grade of cup grease will serve the purpose. This latter will also be applicable to such cam mechanisms as may be involved.



Photograph from Textile World.

Fig. 9—Worsted carding, showing the extent to which operating mechanisms are exposed. They must, therefore, be carefully lubricated at all times.



Courtesy of Hyatt Roller Bearing Co.

Fig. 10—Showing application of a Hyatt roller bearing to a spinning frame cylinder shaft bearing.

Gears and chains can frequently be served by a wide range of lubricants according to their type, method of installation, speed and size. Preferably, they should be enclosed in an oil tight housing, when it will be possible to lubricate them satisfactorily with a heavy oil or gear compound. On larger gears a product having a viscosity akin to cylinder stock (i.e., from 100 to 150 seconds Saybolt at 210 degrees Fahr.,) will give adequate lubrication and protection to the teeth. Exposed installations, on the other hand, are often lubricated by grease.

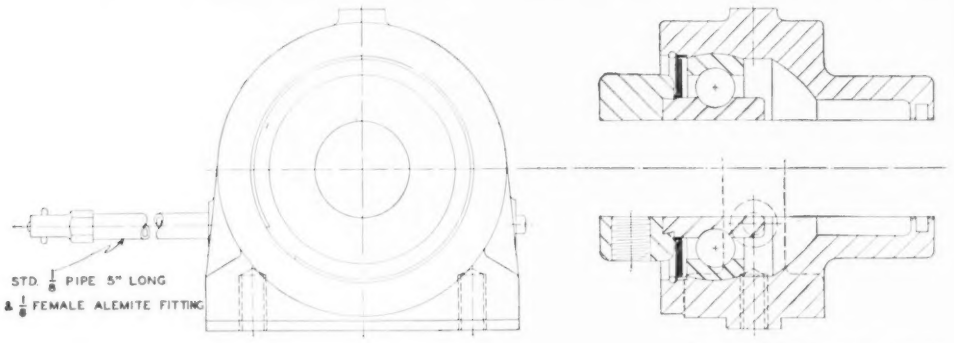
Lubrication of the Cards

The carding machine presents the first lubricating problem by reason of the construction and motion of its comb box. The action of the doffer comb is vibratory, this reciprocating motion being brought about by a suitable cam or eccentric mechanism, operating in a bath of

lubricant. Due to the fact that the comb is usually set with but a few thousands of an inch clearance between itself and the doffer cylinder, it is absolutely essential that the comb box be kept at an even temperature to insure maintenance of this distance and even running of the sliver.

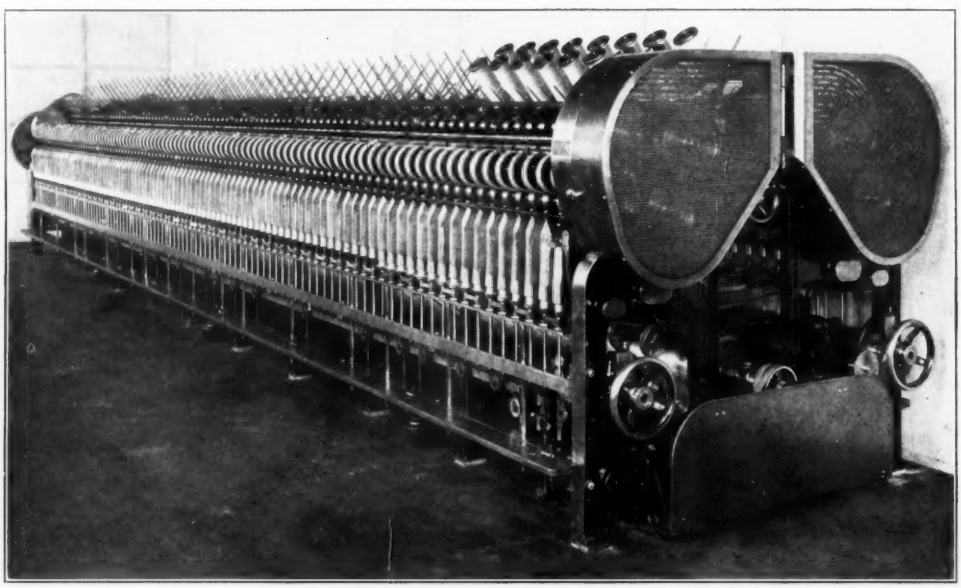
The successful lubrication of this box has always been a problem. Many operators have regarded grease or a fairly viscous oil as the proper lubricant. On the other hand, some greases are relatively inert. In addition, both greases and high viscosity oils will render it difficult to secure the low frictional temperatures which are so necessary. The probable reason for this inherent preference of heavier, more viscous lubricants has been the necessity for preventing splashing or throwing from the comb box where it is subjected to the continued churning action of the cam or eccentric mechanism.

Research has indicated that the use of a lower viscosity lubricant will promote lower frictional temperatures and insure the maintenance of a more uniform clearance between the comb and doffer cylinder. Many comb boxes are, therefore, designed for oil; in others it may be necessary to use a light grease. The soap content will give the requisite body to prevent splashing or throwing; in addition, the actual lubricant in the form of a relatively light mineral oil will assure of minimum frictional temperatures. Lubricant should never throw or splash from the comb box, for the leather



Courtesy of The Fafnir Bearing Co.

Fig. 11—The cylinder and bearing of a spinning frame equipped with Fafnir ball bearings, and provision for pressure grease lubrication.



Courtesy of Whitin Machine Works.

Fig. 12—A worsted cap spinning frame. Note the compact nature of this machine. Every provision is made for protected lubrication.

backing of the card clothing is susceptible to deterioration when spotted with mineral oil.

The sleeve type roll bearing of the average carding machine can be effectively lubricated by a straight mineral oil of from 300 to 400 seconds Saybolt viscosity at 100 degrees Fahr. The utmost care must be taken, however, to prevent oil leakage from these bearings to the card clothing on the main cylinder for the reasons mentioned above.

Ball bearings also have been successfully applied to card roll bearings. When installed in oil-tight housings, they effectively prevent leakage of lubricants to the card clothing. Furthermore, they materially reduce the starting torque, making it practicable to start a woolen card with a minimum of power, and practically no difficulty after shut-downs.

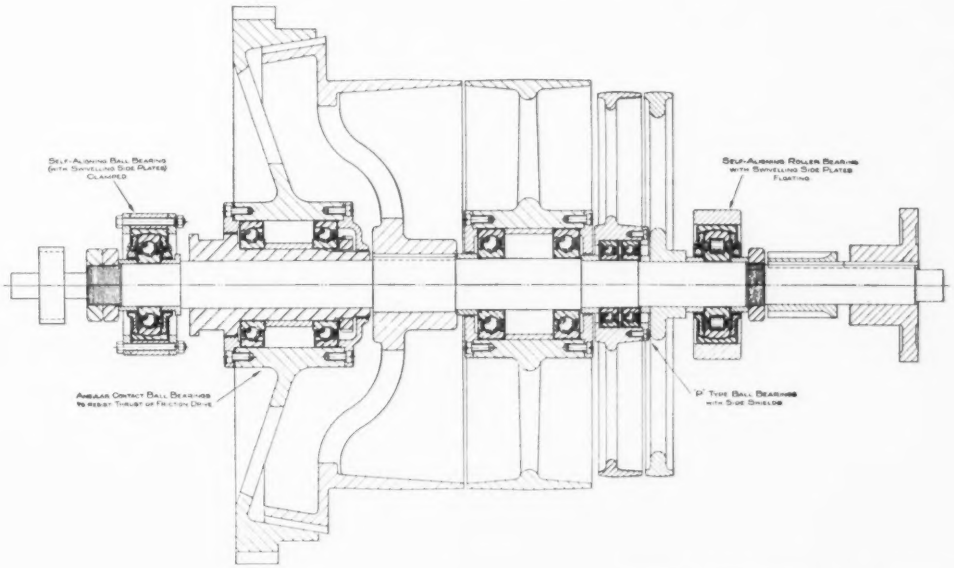
When ball bearings are set in oil-tight housings a highly refined straight mineral lubricant varying in viscosity from 100 to 300 seconds according to speed will often be satisfactory. In event of possible leakage, however, it will be advisable to resort to a low torque grease especially prepared for such bearings.

Gears and chains, in turn, will function effectively if a straight mineral lubricant of from 100 to 150 seconds Saybolt at 210 degrees Fahr., is used. On the other hand, it is perfectly practicable to use a medium bodied cup grease or steam cylinder oil, if desired, although more care will generally be necessary to guard against splashed or dripped lubricants, and possible damage to the card clothing. Such equipment should be enclosed in oil-tight guards or casings wherever possible to permit of bath lubrication and economy of lubricants.

Gill Boxes and Backwashers

The use of oils on gill boxes and back washers involves but one possible difficulty; i.e., in regard to the drums or cans on certain types of the latter machines. In other words, lubrication is a matter of judicious application of oils, greases or gear lubricants to the several bearings, driving chains and gears which are involved.

Backwasher drums or cans involve friction between the drums and their concentric wearing surfaces. Temperature conditions are comparatively high and it is frequently difficult to maintain the requisite film of lubricant within the clearance spaces. For this reason a relatively inert lubricant, or grease of high melting point must be used, although it will be practicable in some cases to use a steam cylinder oil.



Courtesy of Norma-Hoffmann Bearings Corp.

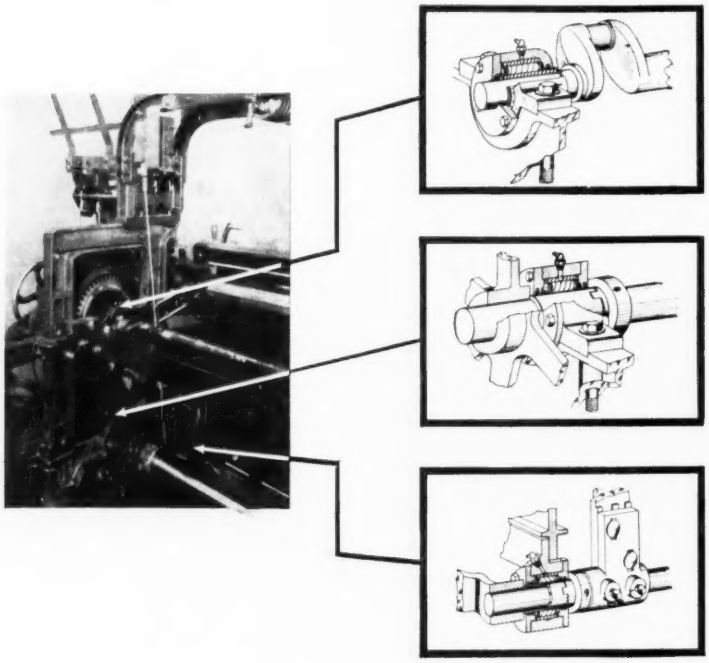
Fig. 13—The loose pulley and clutch pulley drive for a mule spinning machine equipped with Norma-Hoffmann ball and roller bearings.

Stock Conditioning or Fibre Lubrication

In the process of gilling, the wool itself is usually subjected to lubrication or "conditioning"; being treated with a certain amount of oil to soften the fibres and facilitate subsequent combing. Normally an emulsifiable oil is used for this purpose. Resistance to oxidation is an important feature in such products, due to potential gumming. Mineral oils in general will have the least tendency to oxidize, gum or promote spontaneous combustion when the

wool is to be stored for any length of time. On the other hand, they may be somewhat more difficult to wash out from the product.

Free fatty acids also require consideration. These, of course, will tend to exert a corrosive action on certain parts of the machinery as for example, the combing pins. For this reason the choice of wool oils is a decidedly important matter, for any emulsifiable product containing fatty oils will tend to react to free fatty acids later on. Mineral oils, of course, show this tendency to a much lesser degree. Where they are applicable, they should be used sparingly, and careful studies made to determine the requisite amounts. In general, an oil of medium viscosity will be best. If too light it may not coat the fibres completely; whereas if too heavy, it may not only lead to increased power consumption, due to drag on the combs, but also it may not thoroughly penetrate the wool. It is not advisable, however, to use mineral oils on worsteds.



Courtesy of Hyatt Roller Bearing Co.

Fig. 14—End view of a loom mechanism showing manner in which certain of the bearings can be mounted on Hyatt roller bearings. Top right indicates crank shaft. Center right shows the bottom shaft, and below is shown the rocker shaft.

Combing Machine Lubrication

Lubrication of the comber must be carefully studied due to the proximity of its numerous intricate roll bearings, cams, etc. to the wool "tops". The body or viscosity of the lubricants must be contingent upon the operating temperatures, for steam heat by means of an adjacent steam box is regarded as being of considerable advantage in bringing about efficient combing. As a result the bearings, revolving table rollers and drawing off rollers will require a lubricant of sufficient body to adequately resist the thinning out effects of the heat involved. A medium-heavy straight mineral oil will usually serve the purpose satisfactorily. On the other hand, where grease lubrication is preferred, a medium consistency grease should meet the requirements. This same type of grease can also be used on the cam motions. It must, however, have sufficient body to resist the pounding of the cam finger, and any tendency to drip or throw off.

The dabbing motion is of considerable interest from a lubrication point of view due to the speed at which it operates. Normally it consists of a brush fastened to a slide which is actuated by an eccentric to develop vertical reciprocating motion. Lubrication is accomplished by operating the entire mechanism in a bath. It must be maintained without any possibility of splash or leakage. A comparatively fluid grease is usually preferred for this purpose.

Spinning Frames

Drawing, roving and spinning frames, along with the twisters, which serve to combine spun yarns for weaving, involve spindles and a variety of rolls. Speeds are high, continuous operation is mandatory, clearances are low, and a minimum of friction is necessary to enable effective production. The yarn must also be protected against oil spots as much as possible. The lubrication of such machines must, therefore, be carefully attended to under the guidance of mill mechanics familiar with the operating parts and the capabilities of the lubricants employed.

On the front rolls of drawing frames, through which the slivers pass in the drawing and straightening process, lubrication must be directed towards the maximum amount of protection to the leather coverings of the rolls. Should any lubricant creep from the bearings, the rolls might be ruined and the yarn stained. The product must, therefore, be heavy enough to insure its retention in the bearings; at the same time the presence of a small amount of compound will facilitate removal of oil spots in scouring and bleaching. For this reason a

fairly light grease is preferred by many operators. This same lubricant is applicable to gearing and cam mechanisms, etc., although a somewhat heavier product may be more economical in some mills.

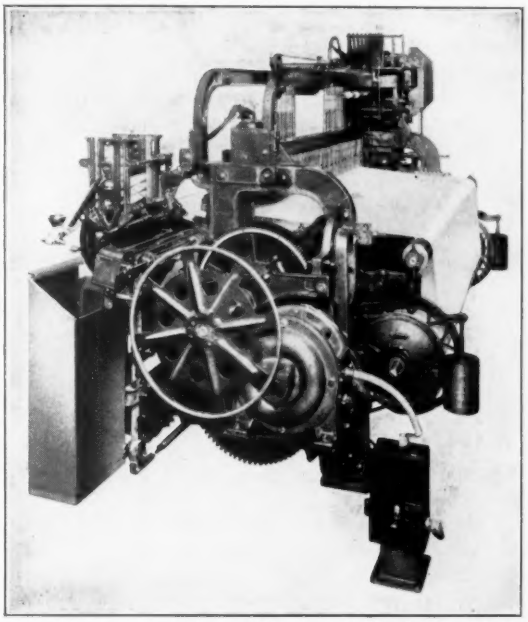
In addition to roll bearings, gears, etc., tne spindles will also present a problem due to the high speeds involved. The matter of viscosity is a most important item here, for power and frictional losses must be reduced in every way possible, otherwise a considerable "drag" or excess of tension may be imposed on the yarn. Within certain limits the viscosity of a spindle oil for ring or cap type spindles should vary inversely with the speed involved; the normal range being in the neighborhood of 90 to 150 seconds Saybolt at 100 degrees Fahr.

The suitability of a spindle oil with respect to viscosity can generally be noted by the temperature difference which exists between the spindles and the surrounding atmosphere. Under ideal conditions there should be no difference. It is impossible, however, to eliminate friction absolutely, therefore, spindles will operate somewhat above room temperatures. A difference of approximately 15 degrees Fahr., would be a fair average in a well organized mill. Internal friction, with increased power consumption, will normally result from the use of too heavy a spindle oil.

For this reason every care should be taken to observe temperature differences and reduce the viscosity of the oils as far as possible. This should not be carried to an extreme, however, otherwise there would be danger of metal-to-metal contact occurring, to lead to excessive wear. This would also be indicated by abnormally high spindle temperatures, excessive power consumption and perhaps ultimate seizing of the spindles. Long before this extreme, however, frequent breakage of the yarn would probably indicate that something was radically wrong.

In some types of spinning compounded spindle oils must be considered. It is essential, of course, to prevent spindle oil from coming in contact with the yarn as far as possible. Frequently, however, constructional details, adverse operating conditions or labor conditions will render it impossible. In such cases it will often be advisable to use a spindle oil which contains a few per cent. of fatty oil in order to facilitate subsequent removal of oil spots and prevent permanent discoloration.

Another important factor is cleanliness. Spindle oils, of course, are very highly refined products, being manufactured with the utmost care to keep them free from contamination. This care should be extended to the mill, and such oils should be stored in clean containers, free from dust and dirt, and handled only in clean oil cans. It will also be advisable to clean out spindle oil reservoirs regularly and refill with fresh oil, for regardless of precautions a certain amount of foreign matter will gain entry, to ultimately cause wear, increased friction and discoloration of the oil, with the possibility of yarn stains.



Courtesy of Crompton & Knowles Loom Works.

Fig. 15—Quick starting and quick stopping are decidedly essential in a loom drive mechanism. The above shows plainly the relation of this mechanism to the other parts of a loom; also manner in which many of these parts are protected in regard to lubrication.

Lubrication in Mule Spinning

Lubrication of the mule frame is normally quite similar to the ring or cap type frame. Spindle requirements may differ, however, especially where the bases are open. For this reason it will frequently be advisable to use a somewhat heavier or more viscous spindle oil than mentioned above, to better assure that it remains in the base where it can do the most good as a lubricant, with least possibility of leakage or throwing to cause yarn stains. As a rule, an oil having a Saybolt viscosity of from 200 to 300 seconds at 100 degrees Fahr., will be most satisfactory. Where mills operate more than one type of spinning frame, however, it will be perfectly practicable to use the same spindle oil throughout, compromising on perhaps a product of 150 seconds viscosity. This might not always give the best results, it is true; but for economic reasons, or to satisfy a desire to concentrate on one oil, it would probably meet operating conditions with average success.

The other operating mechanisms on the mule

frame present no abnormal lubrication requirements. In fact, they are so similar to the parts on the ring or cap type frame that the same lubricants are applicable. Normally these will include a light bodied grease for the roll bearings, a 250 to 400 viscosity oil for other oil lubricated parts, and a medium grease for exposed gears, cams and pressure gun fittings.

Lubrication in the Weaving Room

Weaving procedure involves the warping machine, slasher and, of course, the loom with its attendant mechanisms which are essential to pattern formation. In lubricating such equipment the principal thoughts must be parts protection with prevention of spotting or staining of the goods.

The type, frequency and manner of lubrication will depend to a great extent upon the nature and construction of the moving parts. As a general rule loom parts such as picking motions will require lubrication once or twice daily. Other bearings and gears, however, may run for longer periods without requiring re-lubrication, dependent, however, upon the clearances, the body or viscosity of the lubricant, and the means of application. Plain bearings will predominate on the average loom and other mechanical equipment incident to weaving.

The manner of lubrication is also of interest. Hand lubrication used to prevail to a large extent in most weave rooms. Lately, however, quite some attention has been given to application of automatic devices. As to the responsibility for re-lubrication, in some plants the machine operators have charge of their respective looms, etc. In others it will be customary to have all lubrication taken care of by the loom fixers. This latter procedure is perhaps the most satisfactory, for there will usually be less chance of trouble.

Sleeve type bearings designed for oil lubrication can normally be served with a straight mineral oil of from 300 to 400 seconds Saybolt viscosity at 100 degrees Fahr. Certain heavier bearings, such as those which carry the cloth rolls, etc., or the worm drives for pattern cylinders, however, may require a heavier product, such as a light bodied grease.

Gears and chains require considerable care in their lubrication to prevent dripping or throwing off the lubricant onto the woven goods. For this reason a fairly adhesive lubricant will generally give the best results. Gears and driving chains of the so-called silent type will function best if located in relatively oil-tight casings and oil-lubricated with a straight mineral lubricant of approximately 100 to 150 seconds Saybolt viscosity at 210 degrees Fahr.

Lubrication of Finishing Machines

Finishing machinery can oftentimes be studied along with weaving in considering the proper lubricants. The problem is distinctly a dual one of machine lubrication and cloth protection.

On scouring and fulling machinery, the possibility of soapy water working into the roll bearings and washing out the lubricant must be prevented. Lubrication can, of course, be best effected if the bearings are properly constructed and adequately protected. On the other hand, this will not always hold true for older machines.

Either oil or grease can be used according to the provisions for lubrication. Grease would perhaps best meet the exacting conditions of uneven pressure and possible washing. For this purpose a product composed of a non-soluble soap will usually be most satisfactory. Its consistency should be that of a medium compression cup grease. On the other hand, where ball or roller bearings are installed, a somewhat lighter consistency will give greatest power economies.

Where oil lubrication is required for plain bearings, on raising, napping, cropping and pressing machines, a 300 or 400 viscosity straight mineral product will probably meet conditions satisfactorily. In the case of ball and roller bearings installed in oil-tight housings, however, a viscosity of approximately 100 to 300 seconds Saybolt at 100 degrees Fahr., is usually preferred. Here it is quite as much a problem of protecting the balls, rollers and raceways, from corrosion, as of reducing friction.

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(*Continued from Inside Front Cover*)

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(Normal temperatures)	TEXACO CUP GREASE NO. 3

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Spindles	
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(Mule Type)	TEXACO NABOB, ANSER OR ALEPH OIL
Miscellaneous Other Bearings, Gears, Chains, etc.	TEXACO TEXOLS
	TEXACO NABOB, ANSER OR ALEPH OIL
	TEXACO STAR GREASE NO. 1 OR NO. 3
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Cams and Harness Motion	TEXACO CUP GREASE NO. 00 OR NO. 1
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(Grease Lubricated)	TEXACO CUP GREASE NO. 3
Ball and Roller Bearings	
(In Oil-tight Housings)	TEXACO SPICA OR CETUS OILS
(Where Leakage May Occur)	TEXACO STARFAK GREASE NO. 2 OR
	TEXACO MARFAKS
	TEXACO TEXOLS
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